

AMENDMENTS TO THE CLAIMS

The following is a listing of all claims in the application, wherein Claim 1 is amended and Claims 16-45 are cancelled as follows:

1. (currently amended) A bistable molecule for a multiple electrode device, said multiple electrode device comprising at least one pair of electrodes that form at least one junction and at least one said bistable molecule connecting said pair of electrodes in said junction, said junction having a functional dimension in nanometers or micrometers, said bistable molecule including at least one photosensitive, photodecomposable functional group, wherein said bistable molecule comprises a main chain and at least one pendant group and wherein at least one photosensitive, photodecomposable functional group is attached either to said main chain or to said pendant group, said bistable molecule exhibiting bistability irrespective of the presence or absence of said at least one photosensitive, photodecomposable group.

5 Claims 2-5 (canceled)

6. (original) The bistable molecule of Claim 1 wherein said photosensitive functional group is sensitive to ultraviolet, electron-beam, or X-ray radiation.

7. (canceled)

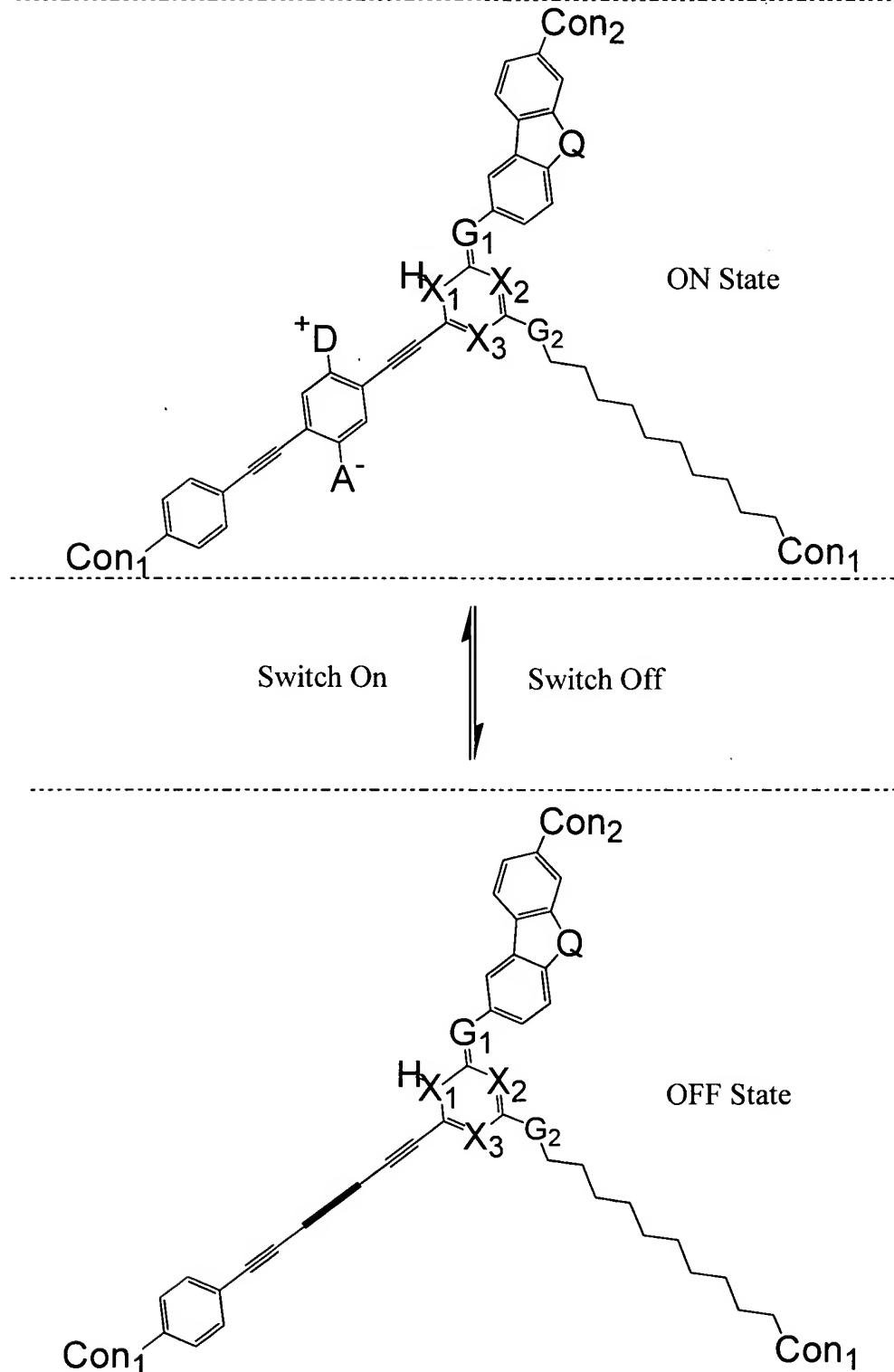
8. (previously presented) The bistable molecule of Claim 1 wherein one said photosensitive group is attached to at least one end of said bistable molecule.

9. (previously presented) The bistable molecule of Claim 1 wherein said photosensitive group is selected from the group consisting of α -carboxy-2-nitrobenzyl; 1-(2-nitrophenyl)ethyl; 4,5-dimethoxy-2-nitrobenzyl; 1-(4,5-dimethoxy-2-nitrophenyl)ethyl; (4,5-dimethoxy-2-nitrobenzyloxy)carbonyl; 5-carboxymethoxy-2-nitrobenzyl; [(5-carboxymethoxy-5-nitrobenzyl)oxy]carbonyl; desoxybenzoinyl; and anthraquinon-2-ylmethoxycarbonyl.

10. (original) The bistable molecule of Claim 1 wherein said molecule evidences switching based on electric (E) field induced band gap change, selected from the group consisting of:

- (1) an electric field ("E-field") induced rotation of at least one rotatable section 5 (rotor) of a molecule to change the band gap of the molecule (rotor/stator configuration);
 - (2) E-field-induced charge separation or recombination of the molecule via chemical bonding change to alter the band gap:
 - (2a) E-field-induced band gap change caused by the change of extended conjugation via charge separation or recombination accompanied by increasing or decreasing 10 π - and/or p-electron localization;
 - (2b) E-field-induced band gap change caused by a change of extended conjugation via charge separation or recombination and π -bond breaking or formation; and
 - (3) E-field-induced band gap change via molecular folding or stretching.

11. (original) The bistable molecule of Claim 10 wherein said bistable molecule com-



15 prises:
where:

20 A^- is an Acceptor group comprising an electron-withdrawing group selected from the group consisting of (a) carboxylic acid and its derivatives, (b) sulfuric acid and its derivatives, (c) phosphoric acid and its derivatives, (d) nitro, (e) nitrile, (f) hetero atoms selected from the group consisting of N, O, S, P, F, Cl, and Br, (g) functional groups with at least one of said hetero atoms, (h) saturated or unsaturated hydrocarbons, and (i) substituted hydrocarbons;

25 D^+ is a Donor group comprising an electron-donating group selected from the group consisting of (a) hydrogen, (b) amines, (c) OH, (d) SH; (e) ethers, (f) saturated or unsaturated hydrocarbons, (g) substituted hydrocarbons, and (h) functional groups with at least one hetero atom selected from the group consisting of B, Si, I, N, O, S, and P, wherein said Donor group is more electropositive than said Acceptor group;

30 Con_1 and Con_2 are connecting units between one molecule and another molecule or between a molecule and a substrate, said connecting units containing an attaching unit and at least one of said connecting units containing said photosensitive group, wherein said photosensitive group is selected from the group consisting of photosensitive azo, photosensitive ester, photosensitive ether, photosensitive amide, photosensitive imide, photosensitive amine, photosensitive imine, photosensitive carbonate, photosensitive carbamate, photosensitive thio-ether, photosensitive thio-ester, photosensitive isocyanides, and photosensitive hetero-ring systems with at least one hetero-atom selected from the group consisting of N, O, S, B, and P, and wherein the attaching unit is selected from the group consisting of (a) carboxylic acid and its derivatives, (b) sulfuric acid and its derivatives, (c) phosphoric acid and its derivatives, (d) hetero atoms selected from the group consisting of N, O, S, B, Se, and P, (e) functional groups with at least one of said hetero atoms (f) hydrocarbons, and (g) substituted hydrocarbons;

40 X_1 , X_2 , X_3 are tuning units built into the ring system which serve to tune the electronic properties, the optical properties, or both, of the bistable molecule as well those of the ring system undergo a smooth and desired tautomerization transition under the influence of an applied external E-field, wherein the tuning units are selected from the group consisting of a hetero atom selected from the group consisting of N, P, and As; hydrocarbons; and substituted hydrocarbons;

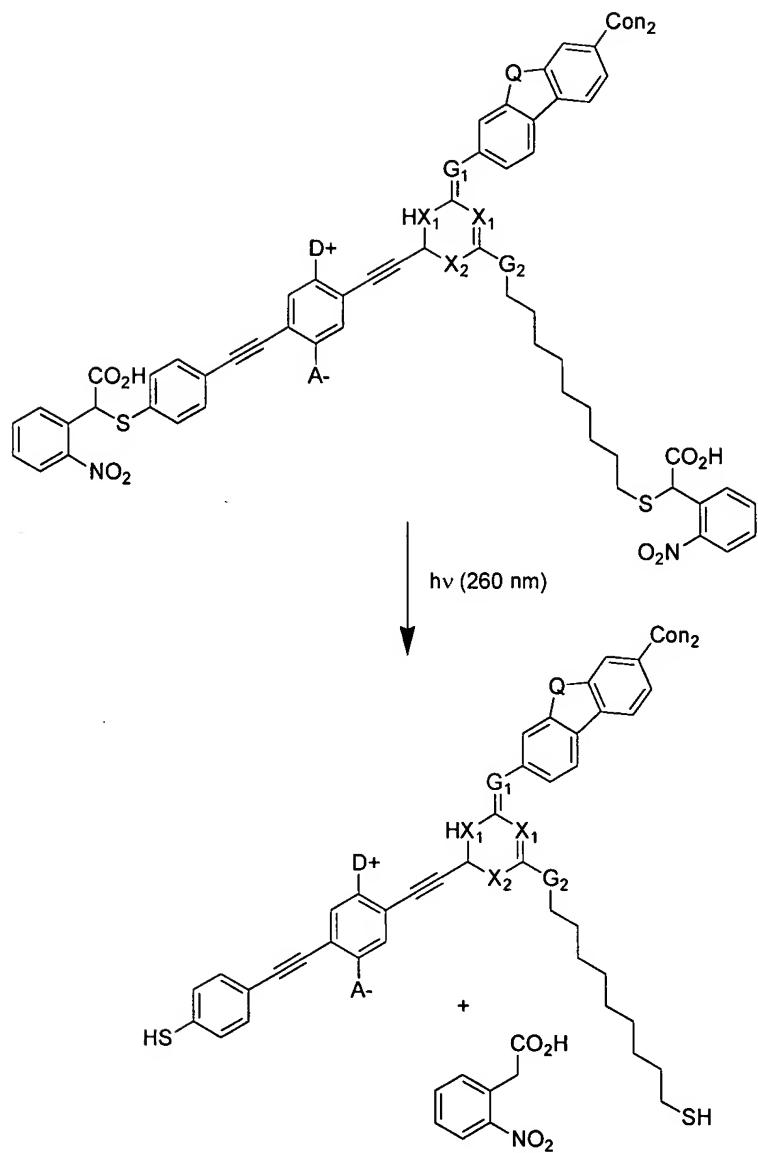
45 G_1 and G_2 are bridging groups for connecting stator and rotor portions of said bistable molecule or for connecting two or more fragments to achieve desired molecular properties,

50 wherein the bridging groups are either (a) selected from the group consisting of (i) hetero atoms selected from the group consisting of N, O, S, and P; (ii) functional groups with at least one of said hetero atoms; (iii) saturated or unsaturated hydrocarbons; and (iv) substituted hydrocarbons or (b) selected from the group consisting of a single atom bridge and a direct sigma bond between said rotor and stator portions;

55 Q is a connecting unit between two phenyl rings, selected from the group consisting of S, O, NH, NR, hydrocarbons, and substituted hydrocarbons; and

H is a hydrogen atom.

12. (original) The bistable molecule of Claim 10 wherein said bistable molecule comprises:



5 where:

A^- is an Acceptor group comprising an electron-withdrawing group selected from the group consisting of (a) carboxylic acid and its derivatives, (b) sulfuric acid and its derivatives; (c) phosphoric acid and its derivatives, (d) nitro, (e) nitrile, (f) hetero atoms selected from the group consisting of N, O, S, P, F, Cl, and Br, (g) functional groups with at least one of said hetero atoms, (h) saturated or unsaturated hydrocarbons, and (i) substituted hydrocarbons;

D^+ is a Donor group comprising an electron-donating group selected from the group consisting of (a) hydrogen, (b) amines, (c) OH, (d) SH, (e) ethers, (f) saturated or unsaturated hydrocarbons, (g) substituted hydrocarbons, and (h) functional groups with at least one hetero

15 atom selected from the group consisting of B, Si, I, N, O, S, and P, wherein said Donor group is more electropositive than said Acceptor group;

Con₂ is a connecting unit between one molecule and another molecule or between a molecule and a substrate, said connecting unit containing an attaching unit and said photosensitive group, wherein said photosensitive group is selected from the group consisting of photosensitive azo, photosensitive ester, photosensitive ether, photosensitive amide, photosensitive imide, photosensitive amine, photosensitive imine, photosensitive carbonate, photosensitive carbamate, photosensitive thio-ether, photosensitive thio-ester, photosensitive isocyanides, and photosensitive hetero-ring systems with at least one hetero-atom selected from the group consisting of N, O, S, B, and P and wherein the attaching unit is selected from the group consisting of carboxylic acid and its derivatives; sulfuric acid and its derivatives; phosphoric acid and its derivatives; hetero atoms selected from the group consisting of N, O, S, B, Se, and P functional groups with at least one of said hetero atoms; hydrocarbons; and substituted hydrocarbons;

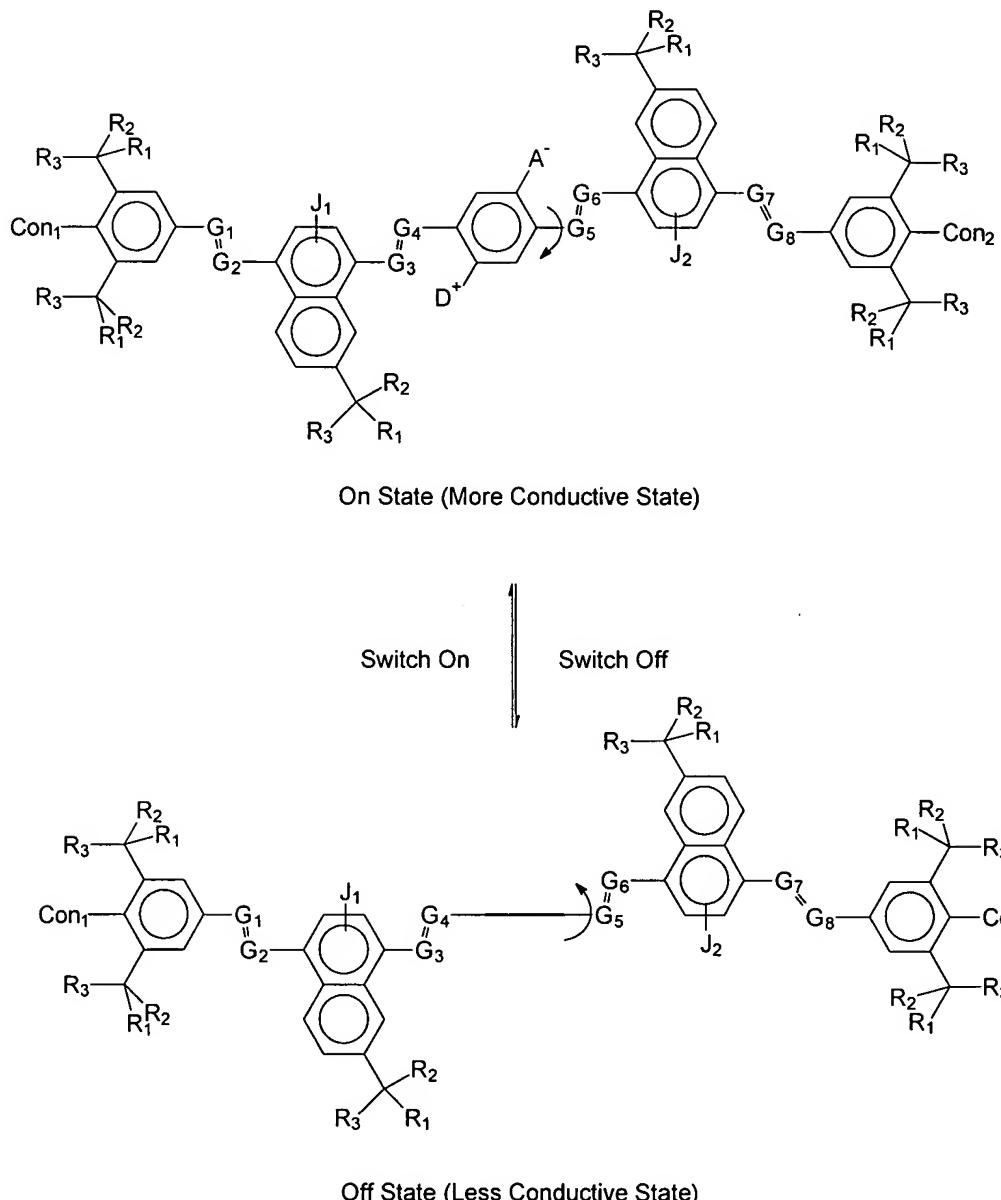
30 X₁, X₂, X₃ are tuning units built into the ring system which serve to tune the electronic properties, the optical properties, or both, of the bistable molecule as well as to that the ring system undergoes a smooth and desired tautomerization transition under the influence of an applied external E-field, wherein the tuning units are selected from the group consisting of a hetero atom selected from the group consisting of N, P, and As; hydrocarbons; and substituted hydrocarbons;

35 G₁ and G₂ are bridging groups for connecting stator and rotor portions of said bistable molecule or for connecting two or more fragments to achieve desired molecular properties, wherein the bridging groups are either (a) selected from the group consisting of (i) hetero atoms selected from the group consisting of N, O, S, and P; (ii) functional groups with at least one of said hetero atoms; (iii) saturated or unsaturated hydrocarbons; and (iv) substituted hydrocarbons or (b) selected from the group consisting of a single atom bridge and a direct sigma bond between said rotor and stator portions;

40 Q is a connecting unit between two phenyl rings, selected from the group consisting of S, O, NH, NR, hydrocarbons, and substituted hydrocarbons; and

H is a hydrogen atom.

13. (original) The bistable molecule of Claim 10 wherein said bistable molecule comprises:



where:

5 A^- is an Acceptor group comprising an electron-withdrawing group selected from the group consisting of (a) carboxylic acid and its derivatives, (b) sulfuric acid and its derivatives, (c) phosphoric acid and its derivatives, (d) nitro, (e) nitrile, (f) hetero atoms selected from the group consisting of N, O, S, P, F, Cl, and Br, (g) functional groups with at least one of said hetero atoms, (h) saturated or unsaturated hydrocarbons, and (i) substituted hydrocarbons;

D^+ is a Donor group comprising an electron-donating group selected from the group consisting of (a) hydrogen, (b) amines, (c) OH, (d) SH, (e) ethers, (f) saturated or unsaturated hydrocarbons, (g) substituted hydrocarbons, and (h) functional groups with at least one hetero atom selected from the group consisting of B, Si, I, N, O, S, and P; wherein said Donor group is more electropositive than said Acceptor group;

$G_1=G_2$, $G_3=G_4$, $G_5=G_6$, and $G_7=G_8$ are bridging groups for connecting stator and rotor portions of said bistable molecule or for connecting two or more conjugated rings to achieve desired electronic properties, wherein the bridging groups are either (a) photosensitive functional groups or (b) selected from the group consisting of (i) hetero atoms selected from the group consisting of N, O, S, and P; (ii) functional groups with at least one of said hetero atoms; (iii) saturated or unsaturated hydrocarbons; and (iv) substituted hydrocarbons, or (c) selected from the group consisting of a single atom bridge and a direct sigma bond between said rotor and stator portions;

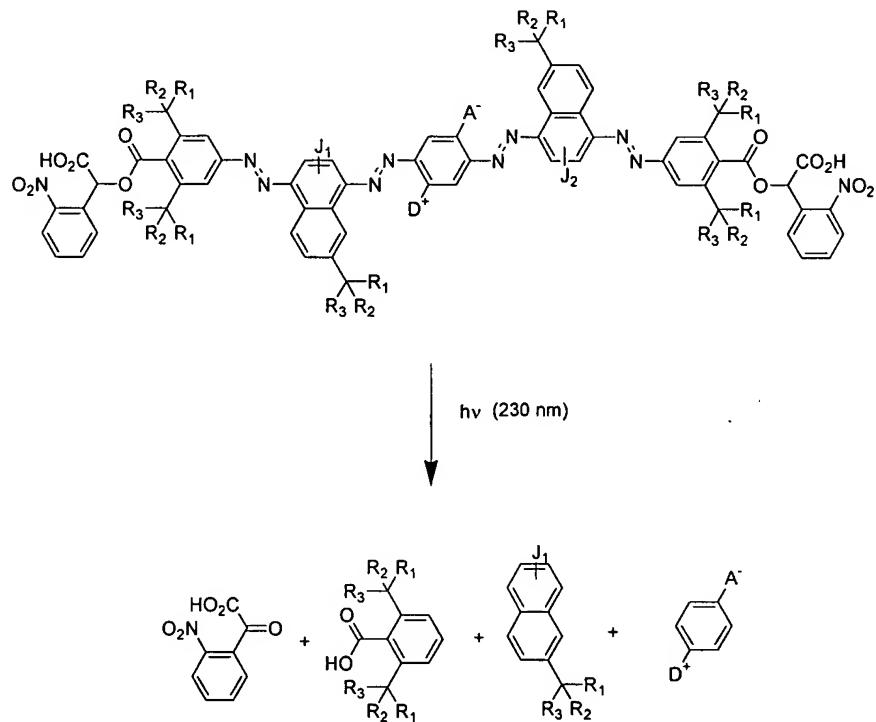
Con_1 and Con_2 are connecting units between one molecule and another molecule or between a molecule and a substrate, said connecting units containing an attaching unit and at least one of said connecting units containing said photosensitive group, wherein said photosensitive group is selected from the group consisting of photosensitive azo, photosensitive ester, photosensitive ether, photosensitive amide, photosensitive imide, photosensitive amine, photosensitive imine, photosensitive carbonate, photosensitive carbamate, photosensitive thio-ether, photosensitive thio-ester, photosensitive isocyanides, and photosensitive hetero-ring systems with at least one hetero-atom selected from the group consisting of N, O, S, B, and P and wherein the attaching unit is selected from the group consisting of carboxylic acid and its derivatives; sulfuric acid and its derivatives; phosphoric acid and its derivatives; hetero atoms selected from the group consisting of N, O, S, B, Se, and P; functional groups with at least one of said hetero atoms; hydrocarbons, and substituted hydrocarbons;

R_1 , R_2 , and R_3 are spacing groups selected from the group consisting of (a) hydrogen, (b) saturated or unsaturated hydrocarbons, and (c) substituted hydrocarbons; and

J_1 and J_2 are tuning groups to provide at least one appropriate functional effect selected from the group consisting of inductive effects, resonance effects, and steric effects, where said tuning groups are selected from the group consisting of (a) hydrogen, (b) hetero atoms selected from the group consisting of N, O, S, P, B, F, Cl, Br, and I, (c) functional

groups with at least one of said hetero atoms, (d) saturated or unsaturated hydrocarbons, and (e) substituted hydrocarbons.

14. (original) The bistable molecule of Claim 10 wherein said bistable molecule comprises:



5 where:

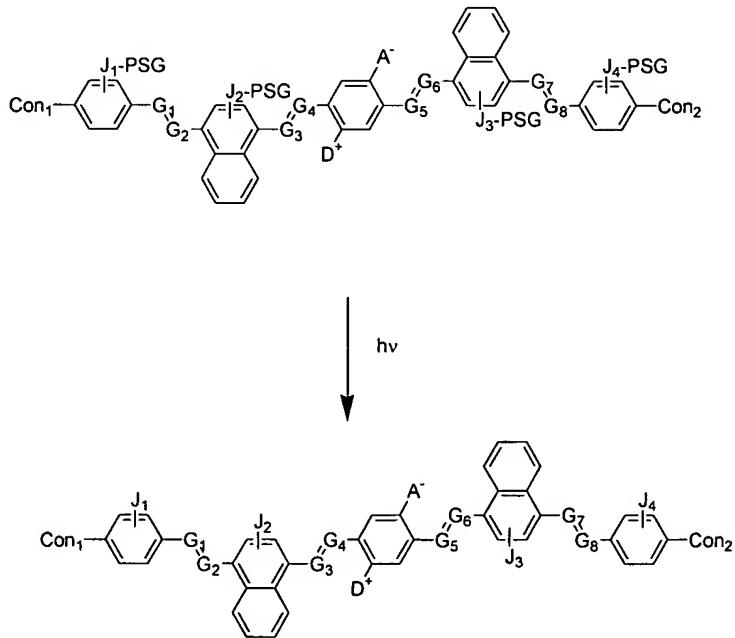
A⁻ is an Acceptor group comprising an electron-withdrawing group selected from the group consisting of (a) carboxylic acid and its derivatives, (b) sulfuric acid and its derivatives, (c) phosphoric acid and its derivatives, (d) nitro, (e) nitrile, (f) hetero atoms selected from the group consisting of N, O, S, P, F, Cl, and Br, (g) functional groups with at least one of said hetero atoms, (h) saturated or unsaturated hydrocarbons, and (i) substituted hydrocarbons;

D⁺ is a Donor group comprising an electron-donating group selected from the group consisting of (a) hydrogen, (b) amines, (c) OH, (d) SH, (e) ethers, (f) saturated or unsaturated hydrocarbons, (g) substituted hydrocarbons, and (h) functional groups with at least one hetero atom selected from the group consisting of B, Si, I, N, O, S, and P; wherein said Donor group is more electropositive than said Acceptor group;

R₁, R₂, and R₃ are spacing groups selected from the group consisting of (a) hydrogen, (b) saturated or unsaturated hydrocarbons, and (c) substituted hydrocarbons; and

J₁ and J₂ are tuning groups to provide at least one appropriate functional effect selected from the group consisting of inductive effects, resonance effects, and steric effects, said tuning groups are selected from the group consisting of (a) hydrogen, (b) hetero atoms selected from the group consisting of N, O, S, P, B, F, Cl, Br, and I, (c) functional groups with at least one of said hetero atoms, (d) saturated or unsaturated hydrocarbons, and (e) substituted hydrocarbons.

15. (previously presented) The bistable molecule of Claim 10 wherein said bistable molecule comprises:



5 where:

A⁻ is an Acceptor group comprising an electron-withdrawing group selected from the group consisting of (a) carboxylic acid and its derivatives, (b) sulfuric acid and its derivatives, (c) phosphoric acid and its derivatives, (d) nitro, (e) nitrile, (f) hetero atoms selected from the group consisting of N, O, S, P, F, Cl, and Br, (g) functional groups with at least one of said hetero atoms, (h) saturated or unsaturated hydrocarbons, and (i) substituted hydrocarbons;

D⁺ is a Donor group comprising an electron-donating group selected from the group consisting of (a) hydrogen, (b) amines, (c) OH, (d) SH, (e) ethers, (f) saturated or unsaturated hydrocarbons, (g) substituted hydrocarbons, and (h) functional groups with at least one hetero atom selected from the group consisting of B, Si, I, N, O, S, and P; wherein said Donor group is more electropositive than said Acceptor group;

G₁=G₂, G₃=G₄, G₅=G₆, and G₇=G₈ are bridging groups for connecting stator and rotor portions of said bistable molecule or for connecting two or more conjugated rings to achieve desired electronic properties, wherein the bridging groups are either (a) photosensitive functional groups, or (b) selected from the group consisting of (i) hetero atoms selected from the group consisting of N, O, S, and P; (ii) functional groups with at least one of said hetero atoms; (iii) saturated or unsaturated hydrocarbons; and (iv) substituted hydrocarbons, or (c) selected from the group consisting of a single atom bridge and a direct sigma bond between said rotor and stator portions;

Con₁ and Con₂ are connecting units between one molecule and another molecule or between a molecule and a substrate, said connecting units containing an attaching unit and at least one of said connecting units containing said photosensitive group, wherein said photosensitive group is selected from the group consisting of photosensitive azo, photosensitive ester, photosensitive ether, photosensitive amide, photosensitive imide, photosensitive amine, photosensitive imine, photosensitive carbonate, photosensitive carbamate, photosensitive thio-ether, photosensitive thio-ester, photosensitive isocyanides, and photosensitive hetero-ring systems with at least one hetero-atom selected from the group consisting of N, O, S, B, and P and wherein the attaching unit is selected from the group consisting of carboxylic acid and its derivatives; sulfuric acid and its derivatives; phosphoric acid and its derivatives; hetero atoms selected from the group consisting of N, O, S, B, Se, and P; functional groups with at least one of said hetero atoms; hydrocarbons; and substituted hydrocarbons; and

J₁, J₂, J₃, and J₄ are tuning groups which contain solvent functional groups selected from the group consisting of OH, NHR, COOH, and CN, where R is alkyl or aryl, wherein J₁-PSG, J₂-PSG, J₃-PSG, and J₄-PSG are linkages of said tuning groups with said photosensitive groups and are selected from the group consisting of ether, ester, carbonate, amide, and carbamate linkages.

40 Claims 16-45: canceled.